

REMARKS

Original Claims 1-56 have been cancelled and have substituted with new Claim 57-111. There are four new independent claims: Claims 57, 72, 96, and 111. There are a total of 55 new claims. It is respectfully submitted that no additional fee is required..

The new claims are fully supported by the original 56 claims. Support for *synthetic styrenic polymers adsorbents* is found in the first paragraph on page 2. The recitation of the *multi-tray fluidized bed* in the adsorbent step finds support in the summary of the invention set forth on page 4 of the application. The recitation that the process is directed to lowering the HAPs in a gas stream to the parts per billion range is found in the background of the invention on page 5. The limitation of having the generation step conducted under a highly turbulent condition is to minimize bead-to-bead diffusion of HAPs as found in paragraph g) on page 5. Minimizing bubbling in the bed in the adsorbent step is found in the penultimate paragraph on page 7 of the application. The requirement of having the spent absorbent during the regeneration step is found in the third paragraph on page 8 of the application. It is respectfully submitted that the amended claims add no new matter to the specification and are fully supported by the specification as filed.

The original claims were rejected for the reasons set forth in the section entitled "Claim Objections" on page 2 of the Office Action. It is respectfully submitted that the new claims overcome these objections.

The claims were rejected under 35 USC 112, first paragraph for the reasons set forth in the section entitled "Claim Rejections - 35 USC § 112" starting on page 2 and going through to page 4. It is respectfully submitted that the new claims overcome the rejections under the first paragraph of 35 USC 112.

All the claims were rejected under 35 USC 103 as being unpatentable over Cioffi et al. (5,676,738) in view of anyone of the following: Mason (2004/0024279), Michalakos et al.

(6503462), Michalakos et al. (2002/0193064), or Stilger et al (5601790). The present invention is directed to a process for removing HAPs from gas streams having low concentration of HAPs and reducing the content down to the parts per billion by volume. Generally, the above cited references are directed to removing HAPs found in large concentrations in gas streams and reducing the HAPs to a low value, but not into the parts per billion range.

The present process employs a synthetic absorbent containing a styrenic polymer to remove the HAPs from the gas stream. The process is carried out in a multi-tray fluidized bed of the synthetic absorbent beads at a rate to minimize bubbling in the bed and to produce an off gas with HAPs reduced to a predetermined ultra low emissions standard until the synthetic absorbent is spent and can no longer reduce the HAPs in the air stream to the ultra low emission limits.

In the second step of the process, the spent synthetic adsorbent is heated and a regenerating air stream substantially free of HAPs is passed through the spent adsorbent to fluidize the adsorbent to minimize bed-to-bed diffusion of HAPs and to desorb the HAPs on the spent synthetic resin to regenerate the synthetic adsorbent so that it can be used in the first step. After the regeneration, the regenerated spent synthetic adsorbent is cooled. This is a broad definition of the invention (see Claim 57). The other claims have other limitations directed to the process that speak for themselves.

In the Cioffi et al. patent ('738) is directed to a process for VOC control employing a solvent recovery system. This process employs a new synthetic, **pyrolyzed**, spherical adsorbent employing either a moving or fluidized bed. The process employs a **pyrolyzed** adsorbent. Pyrolyzation involves the step of heating an organic material in the absence of oxygen to a high temperature to reduce the material to a carbonaceous state. Coal Coking is a pyrolysis process. A pyrolyzed adsorbent is not equivalent to the adsorbent used in the present invention. The adsorbent of the present invention can be warmed sufficiently to desorb the

HAPs from the adsorbent but not to the extent to damage the adsorbent or reduce its adsorbent capacity. Pyrolysis irreversibly damages the adsorbent. For example, in a mass spec instrument, the sample is pyrolyzed to break the sample up into smaller organic fragments which can be identified on the mass spec. Liquefaction of coal and garbage frequently involves the pyrolyzation of the coal or garbage to form a solid carbonaceous material similar to coke and the desired liquid values. Similarly, oil shale is pyrolyzed to break down oil shale to form shale oil. The synthetic styrenic polymeric adsorbent of the present invention could not be pyrolyzed and used in the present process and function as an adsorbent to remove HAPs from gas streams to achieve an ultra low limit. It appears that the '738 process employs a form of activated carbon from the pyrolysis that is regenerated employing high temperature conditions with a stripping gas.

The Mason application which is cited as a publication ('279) is directed to a process of destroying hazardous waste directly from the 55-gallon storage drum through the use of pyrolysis and steam reforming. The process pyrolyzes the waste material to fragment the organic material into smaller organic molecules which report to a gas stream. Virtually all pyrolysis processes leave a carbonaceous solid. The gas stream which is loaded with the smaller organic fragments are treated in a steam reformer with oxygen to oxidize the VOCs to reform the VOCs, carbon monoxide hydrogen to carbon dioxide water and steam. Steam is injected at about 800 to 1,000 degrees C. far in excess of any temperature employed in the present process. Applicant respectfully contends that the '279 publication is not relevant to the present invention as presently claimed.

Michalakos et al. patent ('462) to removed gasses contaminants such as VOCs, carbon monoxide and ozone using a catalyst to oxidize such contaminants. The incoming gas in the process is heated and the gas stream is then passed through an oxidation step such as oxidizing over a catalyst to oxidize the contaminants to carbon monoxide water. The present

process adsorbs HAPs from the gas stream and then the HAP is captured in the adsorbent and then they are released when the adsorbent is regenerated and passed into a regeneration gas stream at a much higher concentration. The regeneration gas stream can be passed into oxidizing conditions to destroy the HAPs. However, '462 patent does not disclose the use of an adsorbent to remove contaminants from an air stream and it does not teach how to reduce the contaminant in an air stream to ultra low levels.

The Michalakos et al., U.S. Application 09888204, cited as a patent publication ('064) is directed to an air cleaning system. Again, the contaminants in the gas stream are oxidized employing a catalyst device to reduce the contaminants to carbon dioxide and water. For the reasons identified above, the '064 is not relevant to the present invention as presently claimed.

The Stilger et al. patent ('790) is directed to a method for destroying the VOCs from a gas stream when the gas stream is passed through an oxidizer for destruction of the VOCs and the hot gasses from the oxidizer are fed to an afterburner for the final destruction of the VOCs. As with respect to the other prior art references, this reference does not teach a method of adsorbing low concentration HAPs or any other contaminants on a synthetic adsorbent containing styrenic polymers and then regenerating the synthetic adsorbent and having a captured HAPs report to a regeneration gas stream in much higher concentrations wherein that gas stream is treated to remove the HAPs either by oxidation, condensation, or adsorption on a material that can be disposed of.

Not only are the process steps and the methods of removing contaminants from gas streams different in the prior art processes from the claim process, they also are directed to treating the contaminants of different types of gas streams. As stated above, the present process is directed to treating gas streams with low concentrations of HAPs to achieve ultra low concentrations of HAPs in the gas stream. The other processes are directed to treating gas streams which contain large quantities of VOCs and destroying the VOCs by aggressive

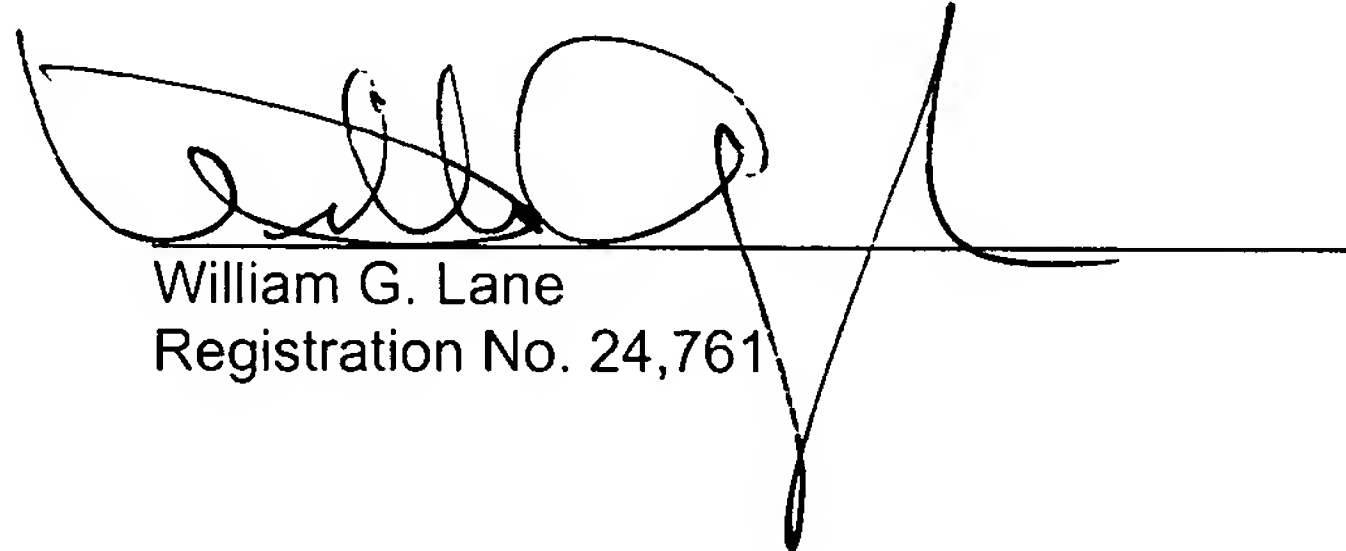
oxidation methods. None of the processes take a synthetic adsorbent and regenerate it without changing its characteristics such as by heating it and regenerating it with a passage of gas under conditions it does not destroy the synthetic adsorbent and does not effect its adsorbent capacity.

It is respectfully submitted that in light of the above-identified new claims and in view of the differences between the invention claimed and the prior art, that the claims are directed to a patentable invention. A favorable action is requested.

Respectfully submitted,

Date:

Sept. 28, 2006

A handwritten signature in black ink, appearing to read 'William G. Lane', is written over a horizontal line. The signature is stylized with loops and a long tail that extends downwards and to the right.

William G. Lane
Registration No. 24,761

Correspondence Address:

WILLIAM G. LANE, INC., P.C.
16485 Laguna Canyon Road, #250
Irvine, California 92618
Tel. 949-585-0348
Fax. 949-585-0494